Mobile Device Camera Connector (Tabiscope)

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Mentors: Dr. Amit Kochhar, Kevin Olds
Project Overview

- Design a low cost endoscopic adapter
  - Needed for third world use where costs are major issues
  - Useful in emergency situations
  - Allows for rapid image sharing when doctors are not on site

- Create a system for Android devices
  - Current solutions only work with iPhones
1) Android tablet with a high-resolution camera
- plan B: receive money to buy an Android tablet - proposal sent to Dr. Kochhar and Dr. Best
  **(Done)**

2) functional endoscopes
- plan A: borrow old flexible endoscope - JH Outpatient Center
  **(Done for flexible scope)**
- plan B: borrow an old rigid endoscope - obtained from Kevin Olds
  **(Done for rigid scope)**
3) Access to a machine shop or 3D printer for manufacturing an adapter
   - plan A: Using the 3D printer in the DMC (Done)
   - plan B: access/training to LCSR Machine Shop/JHU Mechanical Engineering (If Needed)
   - plan C: machinist in the WSE Machine Shop to manufacture our design (If Needed)
   - plan D: friends with access to machine shops to manufacture our design (If Needed)

4) Access to mentors
   - weekly meetings with Kevin Olds (Done)
   - email updates every two weeks (Done)
Original Deliverables

Minimum:
- Adapter for a Specific Android Tablet for an Endoscope (Almost Done)
- Android application: GUI / adjusting tablet’s camera settings (Done)

Expected:
- Working Adapter with Ergonomic grip for easy holding and use (In Progress)
- Android app: GUI / organizing image data by patient identifier (In Progress)

Maximum:
- Universal Adapter for connecting any tablet to any endoscope
- Portable light source that ensures high quality images
- Android app: upload and secure viewing of patient endoscopy images
Design Change 1

- Use of an external camera instead of built-in camera (tablet bulkiness / weight / blindspot vs phone)
  - Mechanical: New adapter design for the external camera
  - Back-end: Need to edit Android kernel for the external camera

![Diagram comparing iPhone and ASUS Tablet]
Design Change 2

- Real-time image processing method (auto-brightness and auto-focus) to prevent specular reflection
  - Back-end: OpenCV for Android, real-time image processing
    - Put into maximum deliverables

Project 7: Tabiscope (Daniel Ahn, Deepak Lingam, Kyle Wong)
New Deliverables

Minimum:
- Adapter for a Specific Tablet **Camera** for Endoscope *(Almost Done)*
- Android app: GUI/external camera images to tablet *(In Progress)*

Expected:
- Updated Adapter with modifications for flaws found during testing
- Android app: GUI / label images (patient identifier) *(In Progress)*
- Real-time streaming **from external camera to tablet** *(In Progress)*

Project 7: Tabiscope (Daniel Ahn, Deepak Lingam, Kyle Wong)
New Max Deliverables

Maximum:

- Universal Adapter for any Tablet **Camera** to any endoscope (unlikely)
- Portable light source that ensures high quality images (unlikely)
- Android application: upload and secure viewing of patient endoscopy images
- **Real-time image processing method to prevent specular reflection**
Minimum Deliverables: Camera Adapter

Minimum:

- Adapter for a Specific Camera for Endoscope (Almost Done)
- Android app: GUI/external camera images to tablet (In Progress)

Expected:

- Updated Adapter with modifications for flaws found during testing
- Android app: GUI / label images (patient identifier) (In Progress)
- Real-time streaming from external camera to tablet (In Progress)
Minimum Deliverable: External Camera Adapter
Minimum Deliverables: App. (Camera Control and GUI)

Minimum:
- Adapter for a Specific Camera for Endoscope *(Almost Done)*
- Android app: GUI/external camera images to tablet *(In Progress)*

Expected:
- Updated Adapter with modifications for flaws found during testing
- Android app: GUI / label images (patient identifier) *(In Progress)*
- Real-time streaming from external camera to tablet *(In Progress)"
Minimum Deliverables: App. (Camera Control and GUI)

*test photos generated by our Tabiscope app and a Laproscope.
Original Schedule

- Planning / Proposal
- Acquisition
- CAD and Design
- Software Implementation
- Manufacturing
- Testing and Feedback
- Design 2
- Documentation
- Max Deliverables
- Writeup

- Min: UI and Camera
- Exp: Patient Identifier
- Min: Adapter
- Exp: Adapter II
- Max: light source, Universal adapter, Sharing Application

Dates:
10-Feb-14  20-Feb-14  2-Mar-14  12-Mar-14  22-Mar-14  1-Apr-14  11-Apr-14  21-Apr-14  1-May-14
Updated Schedule

- Planning / Proposal
- Acquisition
- CAD and Design
- Software Implementation
- Manufacturing
- Testing and Feedback
- Design 2
- Documentation
- Max Deliverables
- Writeup

- Min: UI and Camera (Achieved 3/24)
- Min: Adapter (Expected 3/30)
- Exp: Patient Identifier (Expected 4/23)
- Exp: Adapter II (Expected 4/21)
- Max: Sharing application, Image Processing (Expected 5/2)

Timeline:
- 10-Feb-14
- 20-Feb-14
- 2-Mar-14
- 12-Mar-14
- 22-Mar-14
- 1-Apr-14
- 11-Apr-14
- 21-Apr-14
- 1-May-14
Summary

About a week and a half behind schedule (design change)

- Unlikely to make external light source at current pace
- CAD work on the external adapter needs to get completed and sent for 3D printing
  - Should be done in a week
- An external camera might need to be obtained (currently, testing with USB host tablet adapter + webcam)
Questions and Feedback?
Deliverables Update

Original / Updated / Unlikely:

- Minimum: Adapter and App 3/30
- Minimum: **Camera** Adapter and App 4/6
- Expected: More Universal Adapter and Upgraded App 4/15
- Expected: Upgrades, **Camera** to Tablet streaming 4/21
- Max: Fully Universal Adapter, Light Source, Final App 5/2
- Max: **Universal Adapter**, Final App, Image Processing 5/2